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## Understanding forensic expert evaluative evidence: A study of the perception of verbal expressions of the strength of evidence

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### ABSTRACT

Verbal expressions of evidential strength are routinely used when presenting forensic expert evaluative evidence. The degree to which these verbal expressions are interpreted uniformly among different individuals requires further empirical study. This study focussed on groups of individuals with different roles within the criminal justice system and individuals with varying degrees of expertise and knowledge. Three groups of individuals were identified: laypeople, legal professionals and those with some forensic or investigative knowledge. The participants in the study ( $n = 230$ ) were provided with a case summary to which a verbal expression of the strength of evidence was randomly assigned. Participants were subsequently invited to indicate their perception of the strength of the evidence on a scale that was provided. Generally, across the study groups, the trend was one of increased perceived strength of evidence as the intended strength of the verbal expression was increased, with some notable exceptions. In general, there was good concordance between the groups in the way the different expressions were perceived. It was found that participants performed poorly when it came to differentiating between expressions at the 'strong' end of the scale ('strong', 'very strong' and 'extremely strong'). The findings resonate with calls for validated and robust communication frameworks for evaluative opinions. Further empirical research in this area is warranted and that such research can represent an important contribution towards improving the communication and presentation of forensic evidence.

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### 1. Introduction

The calculation of the likelihood ratio is a central component in the interpretation of forensic evidence. While there is consensus that this can provide a basis for achieving a balanced interpretation of evidence, the manner in which the result of this calculation is reported and presented is the subject of debate and discussion. There are challenges associated with communicating uncertainty and the concordance between intention and understanding when using different methods to expressing this uncertainty has been the subject of much psychological research [1]. The need for frameworks for expressing conclusions in forensic science has been identified [2,3,4] and a scale of verbal equivalents is routinely employed as a means of conveying the strength of evidence. The interpretation of these expressions by different audiences and decision-makers is of great importance. This is the subject of a number of empirical investigations, but there is a need for further work to explore variations in the way expressions are perceived and understood.

Previous empirical studies that have explored this issue have reported some issues with regard to the use of verbal expressions. Mullen et al. [5] examined the perception of verbal expressions among volunteers and while there was some evidence that median perceptions ascended with each level of the scales, there were significant inconsistencies. The study concluded that terms may be misunderstood by lay people and that, generally, the majority of descriptors were found not to convey the intended level of support. The authors question the degree to which the verbal scale fulfils its purpose of assisting the court in understanding the strength of evidence. Martire and Watkins [6], in a re-examination of the data – conclude that the correspondence between expert intentions and lay perceptions is low, meaning that the potential for miscommunication is high. They argue that the verbal scales 'do not appear to fulfil purpose of assisting court or facilitating effective and accurate communication' [6 p.272]. Accordingly, the need for research into an alternative means for expressing likelihood ratios and the requirement for empirical validation when it comes to scales of expressions are both highlighted.

In an investigation into the expression and interpretation of the verbal scale, Martire et al. [7] undertook experiments that revealed evidence of a "weak evidence effect" whereby some participants inverted the direction of support when presented with evidence that provided

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weak support. Martire et al. [8] explored different methods of communicating support. As well as observing the undervaluing of expert testimony, a “weak evidence effect” was also identified when participants were presented with expressions conveying low strength. The utility of low strength verbal expressions was therefore questioned, given that the potential for miscommunication was found to be high.

Therefore, in order to develop the empirical evidence base from which it is possible to further understand the effectiveness of verbal expressions in conveying the intended strength of evidence, this present study explored the perceptions of these verbal expressions among different groups. The research sought to assess the extent to which verbal expressions of the strength of evidence are perceived differently by individuals with different roles within the criminal justice system and individuals with varying degrees of expertise or knowledge.

## 2. Methods

### 2.1. The experiment

Participants took part in a questionnaire exercise that required them to read a brief synopsis of the details of a fictional case in which a piece of footwear mark evidence was presented, along with a verbal expression of the strength of support. Participants belonged to one of three sample groups.

The case précis provided to each participant concerned the same piece of footwear mark evidence. Footwear mark evidence was chosen for this study as it was one of the evidence types employed by Mullen et al. [5]. A volume crime – a burglary – was selected as it was hypothesised that a more “serious” offence may have had an impact on responses.

Having read the case detail and the presentation of the footwear evidence, participants were instructed to indicate the perceived strength of this evidence on a 20 point line which ran from ‘no support’ at one end, to ‘conclusive support’ at the other. The questionnaire materials were identical in all respects other than the accompanying expression from the verbal scale. Versions of the questionnaire were prepared with each of the six verbal expressions (see Table 1) and these were randomly allocated to participants.

The scale chosen for this study was the six point verbal scale recommended by the Association of Forensic Science Providers (Table 1). Participants were not provided with a reference scale as it was deemed that this would have confounded any findings regarding perception accuracy.

Numerical labels were not included on the line that participants used to indicate the strength of evidence. This was because it was deemed that respondents may have been inclined to rely on some form of numeric reasoning when forming their perceptions and this would have had a confounding effect the findings of the experiment. Numbers were added to the 20 point scale during analysis in order to measure the ‘perception of strength’. The first point on the line, ‘no support’, was assigned a value of zero (0), while the 20th point, ‘conclusive support’ was assigned the number 19.

### 2.2. Sampling

Three sample groups were recruited from populations with different roles in the Criminal Justice System and different degrees of expertise; lay jurors, legal professionals and a group of participants with knowledge of forensic science and criminal investigations.

1. Potential lay jurors were recruited through a convenience sampling strategy via several multimedia platforms. Eligibility to vote in the U.K. was used as a qualification criterion. A total of 88 respondents were recruited in this manner. This group was labelled as the ‘lay’ group.
2. Legal professionals were recruited through a snowball-convenience sampling strategy. Legal practitioners were identified and requested to distribute the questionnaire on behalf of the researchers. The Criminal Bar Association advertised the research to readers of its weekly newsletter. This dual strategy enabled access to legal networks. Responses were filtered after collection to ensure that only responses from legal practitioners were included in the analysis. A total of 84 respondents were recruited in this manner. This group was labelled as the ‘legal’ group.
3. The final group was composed of forensic practitioners, students of forensic science and crime/security professionals. These participants were recruited through targeted snowball-convenience sampling. Questionnaires were distributed through contacts at police forces and it was also distributed to attendees at a parallel session on forensic science at the 8th International Crime Science Conference. A total of 58 respondents were recruited in this manner. This group was labelled as the ‘forensic’ group.

## 3. Results & Analysis

### 3.1. Perception of verbal expression

#### 3.1.1. All responses

Data for the three sample groups were combined and Fig. 1 displays the perceptions of each respondent across the three groups ( $n = 230$ ). The general trend is one of increased perceived strength of evidence as the intended strength of the verbal expression is increased, albeit with some exceptions. Boxplots for the same data, combined across the three sample groups, are displayed in Fig. 2. A general trend of increased perceived strength of evidence with increased intended strength can be observed, while the greatest variability in perceived strength was evident when the evidence presented provided ‘weak’, ‘moderately strong’ or ‘extremely strong’ support, although the influence of extreme responses should be acknowledged here. It is notable that, across the three groups, ‘strong’, ‘very strong’ and ‘extremely strong’ were perceived similarly by respondents. Descriptive statistics for the combined data are provided in Table 2. The mean perception rating generally increases with each gradation. However, the mean rating for ‘extremely strong’ is lower than that of ‘strong’ and ‘very strong’. It is evident that the differences in mean values between the expressions at the upper end of the scale are small (‘strong’ = 12.4, ‘very strong’ = 12.8 and ‘extremely strong’ = 12.3). However, as indicated in Fig. 2, the mean value for ‘extremely strong’ is affected by a small number of extreme responses between 0 and 2 on the perception scale. The median perception ratings, which are less affected by these responses, do reflect the trend of increased perceived strength as the intended strength is increased, with smaller increases at the upper end of the scale.

#### 3.1.2. The three sample groups

Table 3 provides descriptive statistics for the response data for the three sample groups. The perceptions of the respondents in each sample group are displayed in boxplots (Figs. 3–5). In all three groups, we observe the general trend of increased perceived strength as the intended strength is increased, particularly if we examine the median values

**Table 1**  
Recommended likelihood ratio terminology [4].

Numerical expression	Verbal expression (support)
>1–10	Weak
10–100	Moderate
100–1000	Moderately strong
1000–10,000	Strong
10,000–1000,000	Very strong
>1,000,000	Extremely strong

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